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LIPOMA OF THE COLON

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LIPOMAS are regarded as the most benign of neoplasms, and usually such is the case. But their occurrence in certain rare locations may present a hard problem to the clinician and a serious surgical risk to the patient.

Lipomas of the gastrointestinal tract are rare. Pathologically there are two types, subserous and submucous; clinically, there are two kinds—those producing symptoms and those producing none.

INCIDENCE OF SUBMUCOUS LIPOMA OF THE GASTROINTESTINAL TRACT

Comfort,[1] 1931, found 24 in 3,924 consecutive autopsies; an incidence of 0.6 per cent. His total number collected from all sources was 181. All subserous lipoma were excluded. Kirschbaum[2] found 2 in 5,734 autopsies.

Comfort reported 11 in 3,924 consecutive autopsies. Pemberton and McCormack,[3] 1937, collected 97 cases with symptoms plus 19 cases found at autopsy and reported in the literature, making a total of 116 cases. Three cases had been seen at Mayo Clinic since Comfort's 1931 report.

Site of Tumor: The cecum, ascending colon, and sigmoid flexure are the most common sites, in the order named. Pemberton's chart is reproduced below.

There are two groups; in the first, the picture is that of intestinal obstruction without particular periodicity. It is characterized by general abdominal distress, distention, colicky, paroxysmal pains, which are usually relieved by bowel evacuation. There is also nau-

Site of Tumor	With Symptoms	Without Symptoms	Total
Ileocecal	1		1
Cecum	22	4	26
Ascending colon	16	5	21
Cecum and ascending colon	1	1	2
Transverse colon	13	1	14
Probably transverse colon	1	0	1
Descending colon	9	0	9
Sigmoid flexure	12	2	14
Descending colon and sigmoid flexure	2	0	2
Rectum	11	1	12
Colon	5	5	10
Probably colon	4	0	4
	97	19	116

Right half	50
Transverse	15
Left half and rectum	37

Symptom Complex In Pemberton's Cases		Our Case
1. Pain	75 cases	present
2. Palpable tumor	64 "	present
3. Constipation	49 "	present
4. Blood in stools	27 "	present
5. Constipation alternating with diarrhea	13 "	present
6. Diarrhea	7 "	inconstant
7. Anemia	7 "	mild

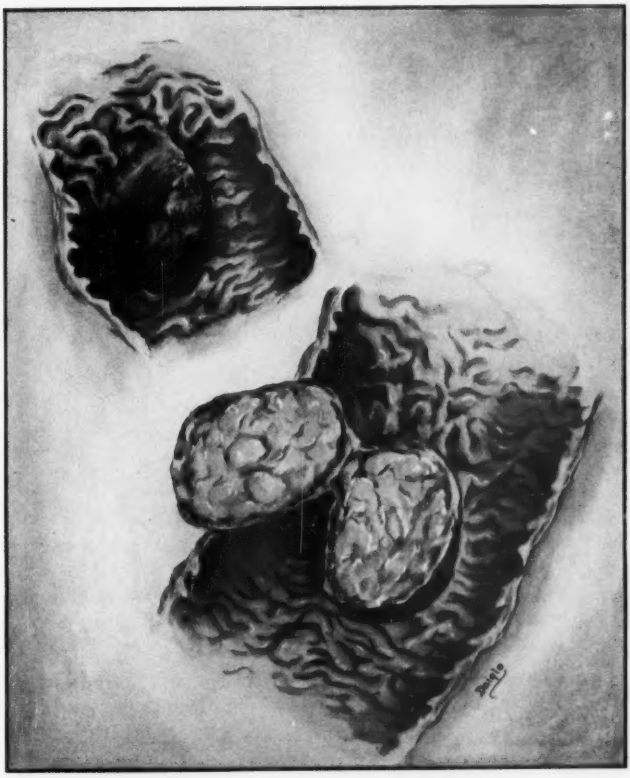
sea, often associated with vomiting. Frequently there is blood in the stools. In the second group, the picture is that of acute intestinal obstruction when first seen. According to Pemberton's summary, one may say that, generally speaking, the history is one of periodic attacks of partial intestinal obstruction, probably complete at times, with periods of good health in between. In carcinoma cases there is a progressive failure of good health.

The average age in Pemberton's series was 49.8 years. In 65 per cent of cases with symptoms the age was between 40 and 60 years. Comfort's[1] series 49 per cent between 40 to 60 years. Sixty-two per cent were women.

Case Report

Mrs. N. H., aged 48, was first seen in November, 1938. Her chief complaints were of cramping pains in the abdomen and of frequent appearance of blood in the stools. She had experienced some nausea, but no vomiting.

The troubles had begun about two years earlier, and then had gradually



grown worse. Her abdomen would become swollen with gas, the pains would come on, and usually stay until she was able to expel a considerable amount of gas or have a bowel movement. She took laxatives very often, and these attacks of constipation were often followed by a mild diarrhea.

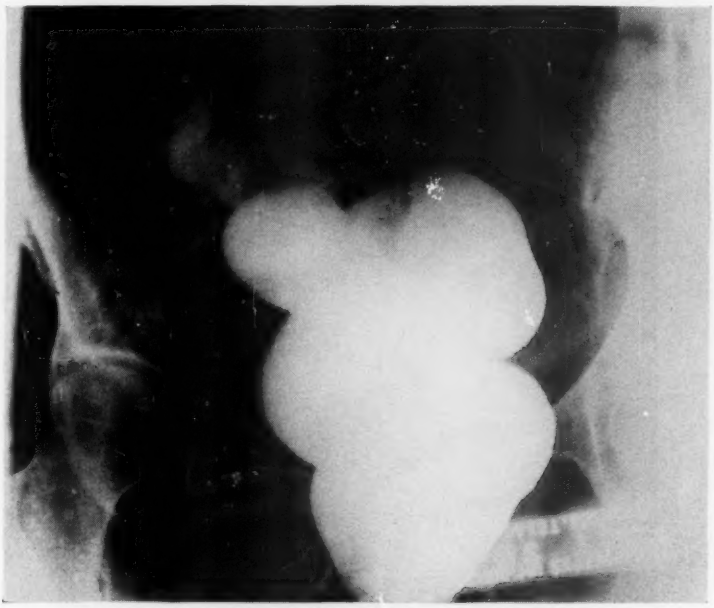


Fig. 1. Barium enema does not pass sigmoid flexure.

During the previous few weeks she had noted the passage of considerable amounts of fairly bright red blood in most of her stools. There had been no loss of weight.

Previous Clinical History. In 1927 she had had drainage of the gall-bladder and appendectomy. She had had no other serious illnesses.

Examination. She was a well developed, well nourished white woman of middle age. Temperature was 98.8, pulse 78, blood pressure 132/84. The abdomen was somewhat distended, soft and tympanitic. A palpable mass, rounded, freely movable, not tender, was located just above and to the left of the umbilicus, and thought to be in transverse colon. Liver and spleen were not palpable.

Laboratory. Hemoglobin, 84 per cent. Red cells, 4,500,000. White cells, 6,000. The differential count was normal.

Urinalysis was negative.

A few weeks before she came to us, we had seen another [illegible] town who also gave a history of diarrhea, cramps, [illegible] period of approximately two years. She was proved to have [illegible] Stool examination on this second patient was negative. A proctoscopic examination was negative for ulcers.

Fig. 2. 24 hour examination—barium in ascending colon. Large number of fecoliths in ascending colon.

X-ray studies were then made. These were reported by Drs. McDeed, Harris and Parker:

"On two successive days a barium enema would not go beyond the sigmoid flexure. A small amount of barium given by mouth did not reveal evidence of an organic lesion in the stomach or small intestines.

"At 24 hour examination, the barium residue was in the ascending colon. A large number of fecoliths were present in the ascending colon. Several fecoliths were revealed in lower descending colon above obstructed area. (figs. 1 and 2).

"*Diagnosis:* 1. Obstructive lesion in sigmoid colon near its junction with descending colon. The lesion is probably a carcinoma.

"2. Multiple fecoliths in colon."

This lady desired to return home for a short while, and come back for further treatment. She returned in two weeks, and another x-ray was made on Jan. 1, 1939. Drs. McDeed, Harris, and Parker reported this as follows:

"Re-examination of the colon: The sigmoid shows no filling defect. The obstruction in the region seen at the last examination was probably due to

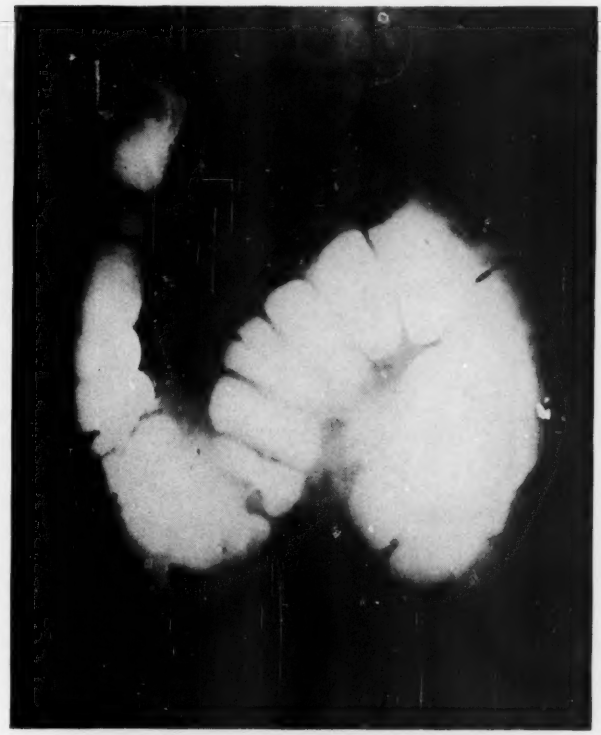


Fig. 3. Large filling defect in splenic flexure.

extreme irritability and spasticity of the bowel. There is a fairly large filling defect in the splenic flexure of the colon which is persistent. The contours of the filling defect suggest an infiltrative growth protruding into the bowel. The changes at the splenic flexure are causing a partial obstruction. After evacuation the ascending colon and transverse colon do not empty. The ascending and sigmoid colon are spastic. The transverse colon is slightly dilated. (fig. 3)

"CONCLUSIONS: The findings are suggestive of a new-growth in the splenic flexure of the colon causing partial obstruction. An impacted foreign body must be considered; however, the findings are not typical of the condition."

On Jan. 19, 1939, a right rectus incision was made, going through the old scar. A small cystic spot on the liver was noted, but it did not appear malignant. No metastatic deposits were found. The glands in the mesocolon were not enlarged. A large, round soft growth about the size of a turkey egg was felt in the splenic flexure of the colon. A mushroom catheter was placed in the cecum, brought out through the main incision for a temporary colostomy. The incision was closed in layers, with one rubber tissue drain. We remarked at the time that the tumor through the intestinal wall felt like a non-malig-

nant tumor. The right ovary had a number of large cysts and this portion was resected.

The cecostomy worked well, and on January 31, resection of the tumor bearing portion of the colon was done, using a left rectus incision, mobilizing the colon, and using a side-to-side anastomosis. Both operations were done under general anesthesia. The tumor was found a little distal to the splenic flexure, very close to it.

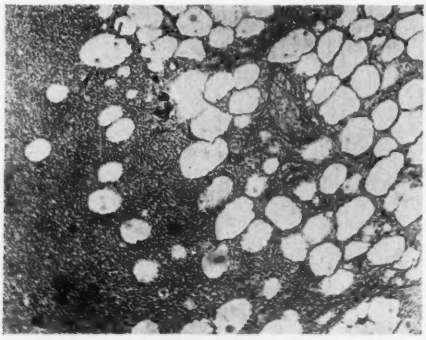


Fig. 4. Section of lipoma.

Fig. 5. Section showing lipoma covered by mucous membrane.

Dr. A. H. Braden rendered the following pathologic report:

"Section of colon measuring 10 cm. in length. A growth projects into the lumen that measures 5 by 4 cm., practically obstructing the lumen. The growth is situated in the midportion of the specimen and is ulcerated and necrotic. Section shows the growth to be composed of golden yellow fatty tissue limited posteriorly by the serous coat. Microscopically, sections show marked inflammatory infiltration and necrosis of the covering mucosa but there is no evidence of malignancy. Underlying the inflamed mucosa is pure adipose tissue.

"DIAGNOSIS: Lipoma."

She made an uneventful recovery, going home February 19. Five days after operation she was passing gas through the rectum. Eight days postoperatively a small amount of fecal matter began to pass per rectum: the next day a normal bowel action was noted, and a normal action daily thereafter. Fourteen days after operation, soapsuds enemas were begun, and a few days later she was allowed to go home. She has had no recurrence of symptoms.

SUMMARY

A case of submucous lipoma of the colon at the splenic flexure with symptoms is recorded. These cases of submucous lipoma of the colon are rare, and this constitutes, as far as we know, the one hundred seventeenth such recorded case.

Such cases will practically always be considered as malignant tumors until the specimen is actually sectioned and its true nature seen. If diagnosis could be made at the first stage operation, simple excision would be the treatment, but due to the rarity of such cases, the conservative treatment will of necessity be as radical as though a carcinoma actually existed.

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THE SEMEN AND STERILITY

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LEEUWENHOEK, in 1677, was the first to describe spermatozoa. Dalenpatius, in 1699, believed that new individuals were enclosed in the spermatozoa, and he wrote as follows:

> We have seen animalcules having just the form of tadpoles, such as are found in brooks and muddy bogs, in the month of May. The tail is four or five times as long as the body. They move with wonderful rapidity and by the strokes of their tails produce little waves in the substance in which they swim. But who would believe that in these a human body is hidden? Yet we have seen such with our own eyes. For while we were observing them attentively, a large one threw off its surrounding membrane and appeared naked showing distinctly two legs, thighs, breasts, and arms. The cast-off skin, drawn upward, covered the head like a cap, and it was a delightful and incredible sight. Because of the minuteness of the object, the sex could not be distinguished. After the little creature had lost its membrane it soon died.

In 1588 Vesalius and Fallopius had observed the ovarian follicles and corpora lutea. In 1672, De Graaf, a Dutch physician, concluded that the function of the ovarian follicle was "to produce and nourish ova and bring them to maturity." However, it remained for von Baer, in 1827, actually to discover the ovum. He wrote, "I was overcome with amazement when I saw the ovule so clearly that a blind man could hardly doubt it." Thus, one hundred fifty years after the discovery of the microscopic spermatozoa, the ova of mammalian animals were first definitely seen.

About one hundred years have elapsed since the discoveries. Actually only in the last twenty-five years has any genuine interest been shown in the study of human sterility, particularly in the male.

In treating sterility, we are aiming at the creation of life, the production of a non-existent infant. This assumes the role of the abstract, and therefore does not excite the average man into full realization of its importance. The ramifications of the results of human sterility are subtle.

In the United States the infant toll from eclampsia is about 5,600 annually. Each year this country is minus between 150,000 and 200,000 infants due to the failure of fertilization of the ovum. Actually this amounts to better than 100,000 more infants than claimed by the mortality of eclampsia. When compared from the viewpoint of the end result, namely, the production of a normal, healthy offspring, then the ideals and aims of treatment of sterility assume a role of relatively greater importance. It seems fitting, therefore, to call the attention of the profession to the causes, methods of study, and treatment of this condition.

In addition to special interrogation designed to appraise the sexual status, and a thorough local examination, analysis of the semen affords a direct index of a man's power of fertilization. The old method of examining a drop of semen from a condom specimen, determining the presence or absence of motility and then rendering an opinion as to the fertility level, should be relegated to the past. A proper semen analysis entails a detailed study. Attention will be devoted in this paper to the correct method of collection, volumetric determination, appraisal of viscosity and turbidity. And of greater importance is an estimation of degree and duration of motility, the total count of spermatozoa, and the study of the morphology of the cells.

Method of Collection

It is undesirable to request a condom specimen for analysis. Condoms contain powders and resins that are inimical to the life of the spermatozoa. An inaccurate result usually occurs. Thoroughly washed and dried sheaths, however, may serve suitably. The best method is to collect the specimen in a glass receptacle. The individual is requested to produce the ejaculate by coitus and withdrawal, or by manual means.

It was formerly thought necessary to preserve the semen at body temperature. However, Moench has studied spermatozoa from specimens kept respectively in the ice box, at room temperature, and in an incubator at 37 degrees Centigrade. He concludes that cold has less devitalizing effect than warmth on the longevity of the spermatozoa. It is preferable, therefore, to keep the specimen in the ice box until ready to perform the examination. The latter should be done at room temperature.

When the semen is inspected shortly after the collection, it is observed to be tenacious, lumpy, and difficult to manipulate. Self-liquefaction takes place after thirty minutes. This assists the motility of the spermatozoa and permits easier handling. It is desirable, therefore, to wait at least a half hour before the analysis is begun. Also, this permits sufficient time for the patient to transport the semen from the home to the office.

The Volume

The seminal pool is obtained from the secretions of the testes, epididymes, prostate, seminal vesicles, glands of Cowper, and numerous glands of the urethra. This secretion affords a nidus for the nourishment of the sensitive spermatozoa. Chemically, it contains glucose in a concentration four times that of human serum. A relatively large number of spermatozoa in a small amount of

semen will readily exhaust the available food supply. Their longevity will be shortened. Also, the appraisal of the quantity of spermatozoa is made on the basis of the number per cubic centimeter. Therefore, the larger the volume, the higher the total spermatozoa count will be and the greater the ultimate fertilizing power of the ejaculate. Actually, the spermatozoa comprise a negligible amount of the total volume. A man may have a normal volume with relatively few spermatozoa. The volume usually averages between 3 and 4 c.c.

There are numerous conditions which influence the total quantity. Intercourse performed with relatively short intervals of rest decreases the count. Patients should be instructed to abstain from sexual indulgence for at least three days prior to submitting the specimen. Semen lost or spilled during the collection should be noted. A volume that is less than 0.5 c.c. is insufficient to provide a medium for the survival of the spermatozoa. It can be readily seen that determination of the volume provides information that is useful in the final appraisal.

The Turbidity

No special significance is attached to the turbidity of the specimen. The turbidity is derived from the lipoid of the fluid from the prostate, and the cellular content. An ejaculate containing no spermatozoa usually has a diminished turbidity.

The Viscosity

It is claimed that variations in the viscosity of the specimen are of little clinical significance if the eventual motility of the spermatozoa is of good grade. However, we know that the viscosity of the semen diminishes progressively and markedly when judged immediately after the collection and 30 minutes later. It is necessary for the spermatozoa to penetrate the mucus of the cervix to enter the uterine cavity. In an attempt to correlate lysis of the mucus and the liquefying power of the semen, Kurzrok and Miller performed interesting clinical experiments. They proved that the normal semen causes lysis of the plug of the mucus that fills and is peculiar to the canal of the cervix. The nature of the lytic substance is unknown, but there is reason to believe it to be an enzyme. It fails to produce liquefaction of respiratory and salivary mucus. It performs its functions best in pH of mild acidity and mild alkalinity. It acts poorly in neutral surroundings. Pus diminishes the power of lysis. These authors go so far as to suggest the possibility that each spermatozoon contains this enzyme. This would account for the ease of penetration of the head through the zona pellucida of the ovum.

Ordinarily the zona pellucida is a membrane resistant to both acids and alkalis. Therefore, the liquefying effect of the enzyme of the semen is an important function. Specimens of low viscosity would accordingly have a diminished lytic action on the mucus of the cervix. In cases of cervicitis, one of the common contributing causes of sterility in the female, the ability of lysis is lessened by the presence of pus. It therefore becomes more difficult, if not impossible, for the spermatozoa to penetrate the tenacious mucous obstruction present in the canal of the cervix. Pus in the semen from chronic prostatitis, a very common condition in the male, mitigates liquefaction. This results in entanglement of the spermatozoa and their elimination as possible fertilizers of the ovum. The relationship of the viscosity and the quantity of mucolytic enzyme present in the semen has not been biochemically appraised. However, for practical purposes a specimen of normal initial viscosity and subsequent self-liquefaction is judged to possess proper quantities of mucolytic enzyme. There are several approved and relatively simple methods of measuring the viscosity of the semen. Evaluation of this quality, then, is an essential feature in the total analysis.

Hydrogen-Ion Concentration

The hydrogen-ion concentration of various fluids of the body has been shown to exert a significant influence on the physiology of the organism. Accordingly, some observers have felt that the pH of the seminal fluid must have an important association with the fecundity of the male. There is no relationship between hydrogen-ion concentration of the ejaculate and the activity and the vitality of the spermatozoa. Messer and Almquest determined the hydrogen-ion concentration by the potentiometer method and made allowance for artificial changes in reaction. The mean value from a group of sterile men was found to be 7.2, with a range varying between 0.7 and 0.8 pH units. Huggins and Johnson report a mean value of 7.6 from a group with normal semen and proven fertility. Therefore, it may be concluded that the reaction of the seminal fluid is nearly always mildly alkaline and has no influence on the male sterility or fertility. The reaction is similar to the mild alkalinity of the canal of the cervix. The pH values of the latter average 8.5, and vary from 8.0 to 9.0. Hence, the determination of the pH of the seminal fluid has no diagnostic value in the appraisal of the fertility of the male.

Motility

For years it has been held and even today many hold that the chief and sole criterion in judging fertility in the male is the presence of motility in the spermatozoa. Nothing could be more erro-

neous. Highly motile cells may be of abnormal morphology with disturbed power of fertilization. It is true that in animals requiring internal fertilization of the ovum, motility is a requisite. But there are many external factors to be considered. As soon as the spermatozoa leave the urethra, they become subjected to the influences of the outside world. We know that motility is diminished by cold, increased by warmth. Light and gravitation apparently are ineffectual on this quality. Chemicals have the power to extinguish the movements, as evidenced by the condom, by artificial alterations of the environment, by extreme degrees of acidity found in some vaginas. Mechanical factors, already alluded to, such as increased viscosity of the semen due to pus from either prostate or cervix contaminating the ejaculate, alter the mucolytic power. This hinders motility by entangling the cells in the viscous semen. Also, the time between issue and examination must be considered. Nevertheless, there are some established standards under which the semen is collected and the activity appraised. Loss of motility in repeated fresh specimens, collected under conditions minimizing harmful external influences, establishes a cause for sterility. From studies of men of proven fertility, it has been established that if 75 per cent or more of the spermatozoa show motility of good grade when examined under ideal conditions within one hour after collection, then no cause for sterility can be ascribed to this factor. However, there are exceptions and variations from this standard. Instances of conception have occurred when these requirements were below so-called normal.

The method of appraising motility is a simple one. The number of spermatozoa crossing the microscopic field under the high dry lens in ten seconds is compared to the immotile forms. This is repeated several times and an average is taken. Specimens are examined 1, 3, 6, 12, and 24 hours after collection, so that an impression of the durability and longevity may be obtained. Normal spermatozoa retain the power of motility on an average of 12 to 24 hours at room temperature. Vose has succeeded in keeping the cells alive for 21 days in a buffered glucose solution.

Before leaving the subject of motility, a word about the Huhner compatibility test seems indicated. This test is performed by taking a drop of secretion from the canal of the cervix within two hours following intercourse. This is examined under the microscope. If there are numerous motile spermatozoa found, it does not mean that male fertility is demonstrated. The cells may be of abnormal morphology or low in total count. The semen may be faulty in other ways. If there are numerous immotile spermatozoa, the blame still cannot be attributed to the male. The cells may have

been active upon arrival at the cervix, but the secretion of the endocervix may be hostile to the spermia. If no cells are found, this still does not evidence male sterility. This may mean that the semen never reached the cervix. The compatibility test provides information that the mechanism of delivery and reception of the ejaculate by the cervix is either normal or abnormal. Determination of the activity or decease, the presence or absence of spermatozoa, affords no index of male fertility. A more accurate and final opinion is obtained by direct analysis of the secretions in the male.

The Spermatozoa Count

The total quantity of spermatozoa affords important information in assisting evaluation of the semen. From various studies the average count of spermatozoa varies from 100,000,000 to 120,000,000 per cubic centimeter. The latter figure was obtained from a group of men of proven fertility. The total number of cells in the specimen, obtained by multiplying the volume of the ejaculate by the count per cubic centimeter, averages between 400,000,000 and 600,000,000 in healthy individuals. Meaker states that pregnancy does not occur with counts below 60,000,000 per cubic centimeter. Macomber and Saunders report from a series of 244 cases, four instances with counts less than 60,000,000 where pregnancy occurred. Hotchkiss has had similar experience. My own records contain one case of pregnancy with a count as low as 25,000,000. At any rate, it is wise to have some standard by which to judge. Sixty million spermatozoa per cubic centimeter seems a reasonable average.

There are numerous influences which affect the count in any individual. Most men maintain a normal level. But a word of warning is offered against expressing dogmatic opinions based on a judgment of a single specimen. More than one count is indicated, and the counts must be spaced properly to afford correct interpretation. Belding reports extreme cases of individuals with a range between 33 and 258 millions and 10 to 200 millions. Among the many factors which seem to influence the count may be mentioned spacing of emission, periodic endocrine dysfunctions, diet, fatigue, acute infections and debilitating diseases. The period of sexual excitement consumed during the skirmishing preliminary to intercourse, has no influence on the cell count. Semen collected in condoms provides consistently diminished counts. Specimens more than three hours old give lowered counts due to clumping of the cells. The higher the total volume of the ejaculate, the higher the total spermatozoa count.

The quantity of spermatozoa per cubic centimeter is obtained by

using the red blood cell field of a standard counting chamber, white pipette, and a formalin-bicarbonate diluting fluid. Specimens should be well shaken before the sample is taken. Three separate samples and counts should be made on any one specimen, as there normally exists a 10 per cent error when performed by those with experience and technic. If 5 squares are counted, and 6 ciphers are added to the total, and the dilution is 1 to 20, then the total number per cubic centimeter is obtained. With a moderate degree of experience, one can develop fair accuracy.

The count offers a guide to the spermatogenic power of the testes. It provides one element in appraising the ability of fertilization of the semen. It gives some insight not complete in itself into the status of the individual's fertility. It offers a means, in cooperation with the determination of the other qualities of the semen, of appraising prognosis and the results of the treatment. However, the spermatozoon count per se loses its value unless there are studies of the morphology of the cells.

Morphology of Spermatozoa

The relationship between spermatozoa of abnormal morphology, sterility, and habitual abortion had its foundation in the work of Williams and Savage, working with bulls at Cornell Veterinary School. They concluded that the morphology of the head of the spermatozoon provides the greatest single source of information as to the fitness of these cells for reproduction. No bull with more than 166 abnormal sperm heads per 1,000 had a good breeding record. Moench adopted these methods to the study of human spermatozoa. The similarity of the results obtained was striking. The types of structural differences were similar, but it was found that in humans, the average percentage of abnormal forms ran much higher. And, when applied to cases of proven fertility and unexplained sterility, curves were obtained, indicating respectively normal and abnormal spermatozoa. This work brought an answer to a hitherto unsolved question. It explained why some men with a relatively low spermatozoa count were fertile, and others, who had large numbers of active cells, were sterile. Much doubt arose, and some investigators stated that Moench's abnormal structural findings were artefacts. In response, Moench applied methods of microdissection to the spermatozoa and proved that the abnormal forms truly existed. Subsequent work brought out the now accepted facts that: (1) In a normal semen the abnormal sperm heads do not exceed 19 to 20 per 100. (2) When the sperm head abnormalities reach 20 to 23 per cent, impaired fertility can be assumed. (3) When the sperm head abnormalities are above 25 per cent, clinical

sterility is usually present. Today no analysis of the semen can be considered of any genuine value unless a morphology study of the spermatozoa is made.

Many methods of staining are available. Some are complicated, others relatively simple. After trying numerous methods, I found that the hemotoxylin eosin stain proved most satisfactory and expedient. Under the oil immersion lens, 300 cells are differentially studied and the percentage of the abnormal heads and forms are noted. In my own experience, covering morphology studies in over 100 cases of disturbed fertility in the male, not a single case of pregnancy has occurred from a specimen containing large numbers of sperm of abnormal structure. From the studies of various other workers, abnormality of the sperm head proved a common cause of sterility in the male.

Familiarity with structural abnormalities is necessary to perform efficiently a differential study in morphology. This item in the appraisal of the semen offers the inexperienced worker most difficulty. Our microscope is a crude instrument when studying structural differences in so minute an object as the spermatozoon. It is beyond the scope of this discussion to detail the various abnormalities. The head, neck, or tail of the cell may present deviations from the considered normal. There are obviously numerous possible aberrations in structure. It cannot be too strongly emphasized that the analysis of the semen is woefully incomplete unless a detailed study of the morphology of the spermatozoa is undertaken.

The following case report will illustrate the importance of this feature, as well as indicate the method of handling a case of sterility in the male.

Report of Case

Dr. K., aged 30, married for seven years, complained of five years of barren marriage. During the first two years of married life contraception had been practiced. Thereafter, an infant was desired, and during the ensuing six months intercourse without contraception failed to produce a pregnancy. The wife was investigated thoroughly with Rubin test, salpingography, and endocrine studies, without revealing any disease.

Then Dr. K. had an analysis of the semen by a competent urologist. He found a slightly diminished volume, averaging 2 to 3 c.c., and 50 per cent of the cells of abnormal structure. An endocrine study, consisting of basal metabolism and sugar tolerance tests, was performed. No glandular disturbance was detectable. However, he empirically received anterior pituitary and thyroid products as well as x-ray therapy to the pituitary gland. These failed to improve the quality of the spermatozoa. The sexual history indicated that the performance of intercourse was normal and practiced about twice weekly. There was no trauma to the scrotum and no exposure to x-ray. Venereal diseases were denied and the blood Wassermann four years previously had been negative. The general health was excellent and no operations had been

experienced. Further questioning revealed that he had mumps in childhood, but could not recall whether or not there was an associated orchitis. The urinary picture was normal, except for the fact that there was dribbling of the urine at the end of each urination. This averaged more than 10 drops.

Physical examination revealed a healthy male. No evidence of general disease was discovered. Local survey disclosed an unusually small external meatus of the urethra. The testes were natural in size and shape with smooth surfaces. However, the consistency instead of being firm and tense was slightly mushy and soft. Laboratory studies indicated that the urine was negative, secretion from the prostate natural, and the blood Wassermann normal. Endocrine investigation showed no dysfunction. Study of the semen on three different occasions disclosed the following averaged findings:

Volume: 2.5 c.c
Turbidity: Normal
Viscosity: Not diminished

Motility: 1 hour, 75 per cent of good grade; 3 hours, 45 per cent grade 2; 8 hours, 40 per cent grade 2; 24 hours, no motility

Count averaged 95,000,000 per cubic centimeter, total, 237,500,000. Morphology study consistently revealed 45 and 50 per cent of the cells abnormal.

This case presented two factors contributing towards sterility. The small external meatus of the urethra prevented forceful and complete emptying of the canal. This hindrance was easily remedied by performing meatotomy. The abnormal morphology was more difficult to explain. No endocrine dyscrasia could be found. The possibility, difficult of proof, was that the structural differences resulted from orchitis of mumps. Further treatment with more concentrated endocrine products in larger doses failed to improve the semen. The latter was normal in every respect except for the morphology of the cells. The treatment with glandular products in the case of this patient failed to improve morphology of the spermatozoa and no pregnancy has resulted.

Conclusions

1. The study of the semen affords a direct method of appraising fertility in the male.

2. Condom specimens of semen are not suitable for analysis, but the semen should be collected in glass.

3. Analysis of the semen includes determination of the volume, turbidity, viscosity, motility, total count, and morphology.

4. The study of the morphology of the spermatozoa may be decisive.

5. A case report is presented emphasizing the need for detail analysis of the semen.

32 Peachtree St.

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INJURIES OF THE SPINE WITH SPECIAL REFERENCE TO THE LIGAMENTUM FLAVUM

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IN presenting this paper I am not unmindful of the old axiom: "Along the peripheral zone of scientific advance there is continuous sniping from error's hilltops." At the risk of being regarded as a sniper shooting at an ill-defined target, I venture an invasion into this subject based upon my own observation and experience in nine cases in which hypertrophies or abnormalities of the ligamentum flavum were recognized.

Several years ago I began to notice some of the conditions found in the course of laminectomies, especially in cases of trauma where the injury was coincident with hyperflexion of the spine, torsion, or lifting while the back was flexed forward. One of the conditions observed was the thickening or enlargement of the ligamentum flavum sufficient to make an indenture or constricting band across the cord. Further investigation of such conditions showed pressure on the nerve roots, especially the posterior roots. It was also observed that the correction of such conditions in the process of laminectomy gave relief to nerve pain, and this relief could not be accounted for by the laminectomy or decompression alone. Checking back I found that the site of the enlarged or injured ligamentum flavum corresponded to the nerve or nerves involved.

Then came the literature of the protruding intervertebral disk and ruptured nucleus pulposus. I began to suspect these conditions in cases of intractable nerve pain and especially in cases where the x-ray and fluoroscope with lipiodol showed filling defects in the neural canal corresponding to the roots of the nerve involved.

A few such cases were operated upon with a wide exposure and thorough exploration both before and after opening the dural sac-sheath, and neither disk nor nucleus pulposus was found. However, some of the patients were relieved and in each of these there was found an abnormal condition of the interspinous posterior roof of the neural canal.

In each of the nine cases the hypertrophy was thought to be due primarily to injuries. The trauma ranged from extremely severe to slight; sometimes it had been recent, at others remote. The trauma was due to several causes, including hyperflexion of the spine, active or passive; or slipping while the spine is hyperflexed; and heavy

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lifting while in flexed or strained position; diving, athletic, automobile, railroad, and obstetric accidents. The two cases in the cervical region were due to diving accidents, the two in the dorsal spine to car wreck and obstetric accident (hyperflexion of the spine with too much pulling). The remaining five were in the lumbar spine.

From my viewpoint, injuries of the ligamentum flavum are so closely connected clinically, pathologically, and histologically with the so-called hypertrophy of the ligament that we shall hereafter use the terms *injury* and *hypertrophy* synonomously. Naffziger says, "In patients with rupture of the ligamentum subflavum trauma was consistently present and often the patient had felt a sudden snap in the back." And from my own observations it is not overemphasizing the frequency and importance of injuries of the ligamentum flavum to suspect them in all cases where there has been trauma of the spine involving hyperflexion with straining, weight bearing, or torsions where there has been distinctly felt a sudden snap in the back. Of course, many cases are of such severe nature that this symptom is overlooked or not felt. It was while dealing with the more severe traumas in the course of laminectomies in the subacute stage of crushing spine injuries with undetermined cord lesions that I first became aware of the potential sequelae of ruptured ligaments, both anterior and posterior.

Anatomy

It would appear to be the peak of preposterousness to suggest that Werner Spalteholz, Johannes Sobotta, Cunningham, and Gray did not accurately describe the ligamentum flavum. However, after careful dissection and study of the ligament at several different levels, I do venture to say that several important features were overlooked by these great writers on anatomy. Spalteholz who, I consider, gives by far the best description of the ligamentum subflavum has only this to say on the subject:

> The ligamenta flava are broad flat bands stretched out between the arches of every two adjacent vertebrae and always proceed from the front surface of the higher arch to the upper edge of the lower. They are especially strong and long on the lumbar and become feebler towards the cervical vertebrae. Their fibres run in a vertical direction; in the median plane they are divided into two halves by a narrow groove. They consist almost exclusively of elastic fibres and are accordingly of a yellow color; hence the name. The band is not present in this form between the occipital bone and the atlas, nor between the atlas and the axis; at the former place is the membrana atlantoccipitalis posterior, at the latter a thin membrane of connective tissue, which is strengthened only by isolated yellow strips of elastic fibres.

Some of its important features not found in the above description are:

1. Its peculiar shape, size and thickness: All of these vary at different vertebral intervals, and therefore reaction of the ligament to trauma at different levels varies.

2. The bony insertion or attachments: Not only do the ligamenta flava extend from the dorsal and upper margin of one lamina to the one adjacent to it, but its insertions extend down the lateral aspects of the lamina and the ligament forms the posterior roof of the neural canal with lateral extensions to meet the anteroposterior ligamentous boundaries of the canal. The ligament extends around and over the articulations of the lamina so as to form a capsule, and is in close contact with the articular facets in the neural canal.

3. The ligamentum flavum differs from all other ligaments in the body in several particulars: It is easily recognized by its characteristic yellow color; it differs widely from all other ligaments in structure and composition because it has both elastic and contractile properties. It has certain peculiarities of repair which I have not observed in other ligamentous tissue—one of which is hypertrophy or enlargement which tends to permanency.

Diagnosis

In many instances, especially those cases which have reached a stage of chronicity, the patient will give such a clear-cut history and description of symptoms that one should suspect enlargement or abnormality of the ligamentum flavum. Like brain tumor, or gallstones, when once suspected, it is easily diagnosed.

The patient will usually give the following:

1. A history of trauma incurred in lifting, bending, twisting, slipping, falls, car collisions, or other accidents.
2. Complaint of low back pain, sciatica, or pains radiating to some part of the lower extremities or sacroiliac joints and pelvis.
3. Failure to gain relief by rest and other conservative treatment.

Differential Diagnosis

A flat x-ray of the spine is of little value as far as the ligamentum flavum is concerned, but should be made in order to rule out dislocations, fractures, and bony deformities. Roentgenograms should be made prone, supine and lateral from each side. By using lipiodol,

gas, or air, one may determine whether there is a filling defect and, if such a defect is found, whether it is lateral, posterior or anterior. If it is anterior it is more likely to be caused by a protruding disk or nucleus pulposus. If posterior and shading off laterally it is probably due to thickened ligamentum flavum.

Lipiodol has been used for many years as an aid in the x-ray delineation of the neural canal. It has certain disadvantages and I feel that it should be discarded. It is a non-absorbable substance which remains as a foreign body in the canal indefinitely unless it should be removed during the process of laminectomy. It becomes encysted with a delicate arachnoid membrane in the lower neural canal. It is said not to cause any trouble but that statement I seriously doubt.

Fay has reported the use of oxygen gas to displace the spinal fluid. I have used air, withdrawing 20 to 40 c.c. of fluid, and injecting the same quantity of air. The head is kept lowered about 30 degrees until the air absorbs (three to four hours). This method has some value and is harmless if due precautions are taken. The correct exposure, both anteroposterior and lateral, will give a clear-cut picture of the canal and any filling defects present.

There is no infallible means of differentiating the cause of a filling defect as viewed by x-ray picture or fluoroscopic examination. It may be produced by hypertrophied ligamentum flavum, ruptured disk, nucleus pulposus, cord tumor, or, though rarely, a new growth in bony tissue.

There is barely room for the spinal nerves to emerge between the intervertebral disks and the lateral posterior part of the ligamentum flavum. Consequently, if there is an abnormality or displacement of either of those structures there will be encroachment or impingement on the nerve at the anterior or posterior roots.

Spinal puncture is of no value as a diagnostic aid. However, when punctures are made for injection of air, gas or lipiodol, routine examinations of the fluid should be made.

If, from the x-ray findings which serve as positive verification of the clinical symptoms, one is reasonably sure of a blocking lesion of the neural canal or nerve root pressure, laminectomy is indicated.

Operative Technic

The essential features of the operation are:

1. Wide exposure
2. Complete exploration of the neural canal and nerve roots
3. Complete resection of the ligamentum flavum.

With coordination of the symptoms, neurologic findings and x-ray, the laminae involved may be accurately judged. It is necessary to remove all of these laminae since it is possible for two or more adjacent ligaments to be involved. I have observed this in only one acute case, when the ligaments between the third and fourth, and fourth and fifth lumbar vertebrae were ruptured and folded into the dural canal.

The incision must include all of the part involved and be wide enough to give free exposure. However, good exposure may be secured by unilateral laminectomy in some cases. I understand that some neurosurgeons use only unilateral exposures. If it is obvious that the ligamentum flavum is the approximate cause of the disability and pain, and there has been no lipiodol used, it will not be necessary to open the sheath (this is really to the advantage of the patient). With wide exposure the neural canal may be satisfactorily exposed laterally and anteriorly, and if there should be a protruding disk or nucleus pulposus, or other abnormal condition, it can be located and remedied. The nerve roots and their exit from the canal may be observed.

In case the ligamentum flavum is at fault there will usually be found a depression in the cord sheath of the thickened ligament, and there will also be found thickening of the lateral portion of the ligament on the affected side. If the lesion is unilateral it will be encroaching on the nerve root and impinging on its channel of exit. Relief comes from a complete removal of all of the ligaments involved. This is done by rongeur and careful supraperiosteal resection.

Illustrative Case Report

Mrs. B., aged 44, had undergone cholecystectomy in 1925, and complete hysterectomy in 1935.

On Jan. 1, 1938, she complained of persistent low backache, severe pain on the medial aspect of her right thigh, running down the right leg, and of a severe "stinging or burning pain in the right pelvis," as she described it, beneath the pubis. She stated that all of her symptoms had come on after she had slipped and fallen on the tile floor of the bathroom one week earlier.

Physical examination was essentially negative. X-rays of the pelvis and hip, lumbar and sacral spine were negative for fracture, dislocation or bony abnormality. Urologic examination was negative.

She did not improve under palliative treatment and rest. It required narcotics to relieve her pain, and she was fast becoming an addict. She was referred to a nearby clinic where a competent orthopedist made a complete study of her condition and made a tentative diagnosis of sacroiliac strain and sciatica. On March 1 she was placed in the hospital and was examined by a neurologist, a surgeon, an orthopedist, and an internist. Each one made a different diagnosis.

At this time she gave a different version of the manner of her injury. She stated that during the act of intercourse on December 24, she was drawn up in such a position of hyperflexion of the back that she felt something snap in her lumbar region with sudden onset of numbness in the right leg. This numbness was quickly succeeded by pain, already described. This late history caused me to suspect a hypertrophied ligamentum flavum, or ruptured nucleus pulposus.

By use of lipiodol and x-ray, as well as fluoroscopically, the filling defect posteriorly between the third and fifth lumbar vertebrae was demonstrated. Checking back from the nerve root symptoms I saw the possibility of the obturator nerve being affected by pressure thus accounting for the pain in her pelvis and inner thigh.

Laminectomy of the third, fourth, and fifth lumbar vertebrae was done. The ligamentum flavum was much thickened between the third and fourth, especially laterally, right. She was relieved.

Conclusion

I have been able to demonstrate by laminectomy abnormalities of the ligamentum flavum sufficient to produce characteristic symptoms in nine cases. All of them followed trauma.

In the past, I am certain that I have overlooked several cases of intractable pain and disability due to hypertrophied ligamentum flavum and no doubt I have misinformed and ill advised patients as to their true condition and the proper remedy.

In conclusion, may I say, that I have purposely chosen this style to challenge or excite your reminiscence in your own experience, and to remind you (paraphrasing the language of Shakespeare), "That it is from the quick forge and working house of thought that truths are fashioned into practical patterns."

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PARTIAL GASTRECTOMY FOR DUODENAL ULCER

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THE popular conception of the proper treatment of duodenal ulcer has undergone a series of changes during the past few decades, largely because of a new conception of the underlying causes. It is now believed that the major factor in ulcer formation is an imbalance of the acid-alkaline secretions of the stomach and duodenum, and that this in turn arises from the combined action of chemical or infectious agents and an abnormal gastric mechanism, perhaps from a derangement of the nervous system, upon susceptible tissues. The ulcer, therefore, is not merely a local disease; rather, constitutional disorders, occupational and environmental factors, and the disposition and mentality of the patient all play a part in its development. This being true, with few exceptions, a thorough trial of medical management is obviously desirable and, in the majority of cases, will effectually relieve the symptoms.

Despite this plan, however, more and more patients with duodenal ulcer are requiring surgical treatment. It has long been recognized that operation is indicated in the presence of acute perforation, hemorrhage, obstruction, and chronic ulcers which have proved resistant to medical management. The increasing use of surgery may be explained by the fact that we are finding a larger number of posterior wall ulcers with serious complications, such as perforation into the head of the pancreas and intractable pain.

Formerly, surgical procedures for duodenal ulcer were limited almost entirely to gastroenterostomy and pyloroplasty. The present trend appears to be toward the more radical operation of gastric resection. Those who advocate gastrectomy contend that the procedure is followed by the lowest number of recurrences and the most complete relief of symptoms. Others regard the likelihood of recurrence after gastroenterostomy and pyloroplasty as insignificant as compared to the risk which, in many cases, is involved in gastrectomy. Postoperative anemia is also offered as an argument against resection. It is true that some degree of anemia frequently follows resection, its severity usually being commensurate with the amount of stomach removed, and that occasionally a pernicious anemia ensues. This contingency may well be ignored, however, when gastrectomy appears to be the only measure which will offer a reasonable assurance of freedom from further disturbance. If necessary, moreover, one may always counteract anemia by supplementing the diet with an additional quantity of iron and liver.

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A third group of surgeons take a middle course in their attitude toward gastrectomy, which, in my opinion, seems to be the most logical one. This of course will be described as it applies, from my personal experience, to the operative treatment of the various types of duodenal ulcers.

It is generally conceded that gastrectomy should rarely be undertaken in the presence of an acute perforation. As a rule, one should attempt no more than mere closure of the ulcer by enfolding and suture of the edges, or by suture of a segment of omentum over the opening. Not infrequently, the ulcer will heal and the symptoms will be completely relieved following the use of this method. Should the symptoms recur, however, one always has the opportunity of carrying out further surgery as the occasion may demand.

The chief considerations in determining the advisability of operation in bleeding duodenal ulcer are the extent of the hemorrhage and the age of the patient. A single simple hemorrhage without other symptoms is not sufficient justification for operation. Recurrent hemorrhage with definite evidence of an ulcer calls for exploration, as does also acute hemorrhage from an ulcer which has resisted adequate medical treatment. The bleeding in such cases will usually be found to arise from a penetrating lesion on the posterior wall of the duodenum. In this event, partial gastrectomy is the procedure of choice. Should the patient be unable to withstand such an extensive operation, however, a transduodenal incision may be made, the bleeding ulcer cauterized, the area sutured from within, and a pyloroplasty carried out in order to destroy the pyloric sphincter and afford drainage of the stomach. If necessary, the stomach may be resected at some subsequent date, when the patient's physical condition has sufficiently improved.

The advisability of surgery in the presence of massive hemorrhage is a debated question. A number of surgeons advocate operation for all patients beyond 50 years of age with massive hemorrhage which fails to respond to transfusion within twenty-four hours, on the ground that the sclerotic condition of the arterial walls in these patients tends to prevent spontaneous thrombosis and cessation of the hemorrhage. In my own opinion, the risk of immediate operation in the presence of massive hemorrhage is too great to warrant such a practice as a routine measure. Not infrequently, moreover, a massive hemorrhage arises from conditions other than ulcer, such as esophageal varices, or lesions of the liver, spleen or small intestine. For this reason, also, exploration should be avoided unless the diagnosis of an ulcer is clear. It is my custom to institute conservative treatment in an effort to control the bleeding and to operate later if the patient continues to have ulcer symptoms.

In my opinion, gastrectomy has no place in the treatment of obstruction caused by stenosis of the pyloric outlet incident to prolonged activity of one or more duodenal ulcers. In the first place, patients with obstructive ulcers of this type are in poor physical condition and cannot withstand an extensive operation; further, because of the low acid values, recurrence of the lesion is extremely unlikely. The obstruction is best overcome by gastroenterostomy. Following this procedure, improvement takes place rapidly and complete relief of symptoms is the rule.

Obstruction arising from inflammatory edema may often be overcome by medical treatment. Not infrequently, however, the edema is superimposed upon a cicatrizing ulcer which is associated with a perforation posterior lesion. If medical measures fail to relieve the obstruction, partial gastrectomy is advisable. Should the condition of the patient and the local findings forbid this course, a gastroenterostomy may be carried out and resection postponed until the tissues have recovered sufficiently to permit safe closure of the duodenum.

The surgical procedure for duodenal ulcers which have proved intractable under medical management should be selected with regard to the relief of hypermotility and hypersecretion. The majority of these lesions are associated with high acid values. Resection of the acid-bearing area of the stomach is the proper treatment in such cases, even in the absence of hemorrhage or partial obstruction, since only by this means can one be reasonably sure that the lesion will not recur. In the presence of low acid values, a mobile duodenum, and only a moderate degree of obstruction, I have until recently performed a pyloroplasty and, when possible, excised the ulcer. When a posterior as well as an anterior wall ulcer was found, the former was left undisturbed; as a rule, healing of the posterior lesion took place spontaneously following relief of pylorospasm. Division or resection of the pyloric muscle effectually eliminated pylorospasm, thus preventing gastric stasis. Drainage of the stomach was slowly, though gradually established after the operation. Lately, under favorable conditions, I have been carrying out partial gastrectomy in preference to this procedure, in the belief that resection more successfully precludes the possibility of further difficulty.

Surgeons differ as to the proper extent of resection. One group recommends removal of two-thirds or four-fifths of the stomach. Such a radical operation, however, is likely to be followed by distressing symptoms incident to anacidity and too rapid emptying of the stomach. In the average case, resection of 50 to 60 per cent of the stomach destroys an adequate amount of the acid-bearing area

to relieve the ulcer symptoms and minimize the postoperative discomfort.

In the hands of the experienced surgeon, the risk of partial gastrectomy in properly selected cases should not be excessive. The principal technical difficulty is encountered in removal of penetrating and adherent ulcers. Caution should be exercised to avoid contamination and leakage, and to prevent hemorrhage. Hardly less vital than skillfully executed surgery in the outcome is the preoperative and postoperative care. Prior to operation for any type of peptic ulcer, with the exception of those presenting an acute perforation, supportive measures should be carried out to correct any nutritional or biochemical disturbances, to relieve inflammation, and to restore muscle tone. The choice of the anesthetic is also an important factor. Many authors recommend spinal anesthesia for gastric resections. During the past few years, I have administered cyclopropane almost exclusively and have found it eminently satisfactory from every standpoint.

In order to make a comparison between our methods of treatment of duodenal ulcer in former years and at the present time, I have reviewed two previous studies, the first including patients observed during the ten year period from 1922 to 1932, and the second those seen during the seven years between 1932 and 1939, and have made a third survey of patients observed within the past year, from May 1, 1939, to May 1, 1940. The last group includes a few patients who came under my care in 1939 and are reported in the second study.

The first series, recorded between 1922 and 1932, comprised 574 patients, of whom 438 were treated medically and 136, or approximately 24 per cent, had operation. Table 1 shows the surgical treatment employed.

TABLE 1.

Surgical Treatment in 136 Cases of Duodenal Ulcer 1922-1932

Gastroenterostomy	103
Pyloroplasty	33
Total	136

It will be seen that none of these patients had gastrectomy.

The second group, those observed from 1922 to 1939, consisted of 194 patients with duodenal ulcer, of whom 52, or approximately 27 per cent, were treated surgically. As a matter of information, 8 patients with gastric ulcer were included in this series, making a total of 202 peptic ulcers. The diagnoses may be seen in table 2 and the surgical treatment in table 3.

TABLE 2.

Classification of 202 Cases of Peptic Ulcer 1932-1939

Clinical, Roentgenologic or Surgical Diagnoses

Primary duodenal ulcer	180
Recurrent duodenal ulcer (2 with marginal ulcer)	12
Marginal ulcer (1 with colon fistula)	2
Gastric ulcer (1 with duodenal ulcer)	8
Total	202

TABLE 3.

Surgical Treatment in 55 Cases of Peptic Ulcer 1932-1939

DUODENAL ULCER	52
Gastroenterostomy	24
Pyloroplasty	15
Partial gastrectomy	8
Closure perforated ulcer	5
GASTRIC ULCER	3
Partial gastrectomy	2
Gastroenterostomy	1

Attention is called to the fact that 8, or approximately 15 per cent of the 52 patients with duodenal ulcer had partial gastrectomy.

During the past year I have treated a total of 38 patients with peptic ulcer, one of whom had an ulcer of the stomach. The diagnoses are shown in table 4.

TABLE 4.

Classification of 38 Cases of Peptic Ulcer May, 1939 - May, 1940

Clinical, Roentgenologic or Surgical Diagnoses

Primary duodenal ulcer	34
Recurrent duodenal ulcer (1 with marginal ulcer)	3
Gastric ulcer	1
Total	38

Of the 37 patients with duodenal ulcer, 14, or almost 40 per cent, were operated upon, as follows:

TABLE 5.

Surgical Treatment in 14 Cases of Duodenal Ulcer May, 1939 - May, 1940

Partial gastrectomy	8
Closure perforated ulcer	4
Gastroenterostomy	1
Pyloroplasty	1
Total	14

It is significant that partial gastrectomy was performed in 8 of the above cases, representing more than one-half of the total, as compared with 15 per cent of resections in the second group. This proportion seems rather high, and probably may be explained by the fact that I have recently encountered a succession of profusely bleeding lesions of the posterior wall. In a larger group of cases, the proportion of resections, although still showing a definite increase, would no doubt be smaller. In 5 of the cases, both anterior and posterior wall ulcers were found, and in another the ulcer was posterior and penetrating into the pancreas. I am inclined to believe that the vast majority of duodenal ulcers are multiple, involving both the anterior and posterior walls, and that those which bleed usually are situated on the posterior aspect and cannot be readily detected except by gastrectomy.

From a comparison of these three groups of cases, it will be observed that, not only is the number of gastrectomies for duodenal ulcer becoming increasingly higher, but more patients are coming to operation. In the first and largest series, 24 per cent of the patients were operated upon; in the second series, 27 per cent; and in the third group, almost 40 per cent received surgical treatment. The number of operations performed during the past year, like the proportion of resections, is of course in a measure excessive, for similar reasons.

We do not have a record of the mortality in the first group, though in the second group the mortality was 10.8 per cent. All of the patients operated upon within the past year have recovered, despite the larger number of partial gastrectomies performed.

It is my opinion that, in the presence of formidable complications, a well planned and properly executed partial gastrectomy, supplemented by appropriate preoperative and postoperative measures will, as a rule, effectually meet the requirements of surgery for duodenal ulcer in that it will not only afford a fairly certain assurance against recurrence, but that the mortality will be maintained at a comparatively low figure for an operation of such magnitude.

FRACTURES OF THE HIP

Four Years Experience with Moore Nails

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THE treatment of fractures of the hip by means of internal fixation dates from 1850 when von Langenbeck reported one case treated by this method. Nicolaysen, Davidson and others reported successful results prior to the announcement of the discovery of the Roentgen ray in 1896. These pioneers were followed by others, but the results were not encouraging and the method was largely abandoned, although excellent results were occasionally reported, notably by Thomas in 1921 and Martin and King in 1922. Whitman reported the method of reduction and cast treatment which bears his name in 1904, and this gradually became standard in the hands of many fracture surgeons. To determine the end results of unimpacted femoral neck fractures a careful two-year survey of 566 cases of complete, intracapsular fractures of the neck of the femur treated in various well known clinics was made during 1928-29 by a committee appointed by the American Orthopaedic Association. Their final report, rendered in 1930, showed that bony union was obtained in 51.9 per cent of all cases treated by closed methods, but in patients beyond 60 years of age only 30.4 per cent obtained bony union. The mortality during treatment was about 20 per cent. It also indicated that methods of internal fixation then in use gave far better results than did conservative methods.

Interest in internal fixation was greatly stimulated in 1931 by Smith-Petersen who reported a method of open reduction and fixation of fragments under direct vision with a three-flanged nail. Twenty-four selected cases were originally reported with 75 per cent bony union and no operative mortality. This procedure was considered too formidable for general use by many surgeons, and methods of inserting the nail without incising the joint were reported by Westcott and Johansson in 1932. Leonard and George in 1932 reported a method of taking lateral roentgenograms of the femoral neck. Although the curved casette has been largely replaced by other methods, their contribution must be regarded as a major factor in the successful treatment of fractures of the hip.

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Many varying methods of internal fixation have since been reported with good results by Moore, Gaenslan, Knowles, Telson and Ransohoff, Henderson, Albee, Dyas and others. This principle is now considered favorably by many bone surgeons, and in an attempt to determine the true merits of the various methods a hip

Fig. 1. Schematic drawing of circulation of the proximal end of the femur. (A) Nutrient artery passing through femoral neck. (B) Capsular arteries which constitute major source of blood supply to femoral head. (C) Artery of ligamentum teres (variable). Intracapsular (or central) fracture may destroy all blood supply except the variable amount from the ligamentum teres (C) and it is possible that this source may also be destroyed at time of injury. Extracapsular (or intertrochanteric) fracture probably destroys only the blood supply through the nutrient artery (A), which leaves an adequate supply through B and C.

fracture registry has been established by the American Academy of Orthopaedic Surgeons. Fourteen hundred eighty-five cases of fracture of the femoral neck treated by one hundred different surgeons have been registered, and will be critically studied for a period of several years. After one year's follow-up bony union was found to be present in 83.6 per cent. Further reports at yearly intervals will do much to establish the value of this method of treatment.

It appears from the above and similar studies that the principle of internal fixation is sound, and it is reasonable to expect that further developments in the fields of physiology, metallurgy, radiology and joint surgery will further improve the end results.

Fig. 2. Dec. 29, 1935. Typical comminuted, intertrochanteric fracture. (Case 1, man of 67.)

Hip fractures may be classified in two main groups—the central or intracapsular and the intertrochanteric or extracapsular. Both are primarily injuries of the aged, usually produced by falls onto the hip region, often within or about the home. Here the similarity ends, as the intertrochanteric or extracapsular fracture unites readily with support by traction or splint, while the intracapsular or central fracture presents problems of union of such magnitude that in 1934 it was called by Kellogg Speed "the unsolved fracture," and in 1937 Albee described it as "the most unfavorable of all fractures as to union."

Many reasons have been advanced for the frequent failure of union in the intracapsular fracture but at present it is generally agreed that failure most frequently results because of:

1. incomplete reduction of the fracture;

Fig. 3. Union in varus is present. Distal nail unscrewing within head. The wire uniting the nail bases is broken. Sept. 24, 1937. (Case 1.)

2. inadequate fixation of the fragments, or
3. impaired blood supply to the detached femoral head.

It is felt by many surgeons that complete reduction can usually be obtained by use of the Whitman or Leadbetter manipulation, checking the position of the fragments after reduction by two plane x-ray; and that some type of internal fixation results in better immobilization of the fragments than does any form of external cast or splint. J. S. Speed found that 35 per cent of femoral heads underwent aseptic necrosis following central fracture as the result of inadequate blood supply. Although union may occur after the head becomes necrotic it is my belief that some method of insuring adequate circulation to the detached femoral head must be devised before further marked improvement in late end results can be expected.

Fig. 4. Mar. 9, 1936. Typical intracapsular fracture of femoral neck. (Case 2, woman of 64.)

Since December 1935 I have employed the Moore method of internal fixation, using three or four adjustable stainless steel nails. This method was chosen because it was felt that it resulted in minimal shock to the patient and in minimal circulatory damage to the head and neck of the femur. To date it has been employed in a total of 56 cases of hip fracture. It was employed in three cases of slipped capital epiphysis of the femur in addition to the above. Of the fractures 48 were intracapsular and 8 were intertrochanteric. The intracapsular fractures were consecutive and unselected. The intertrochanteric fractures were selected, with the hope that certain types might prove suitable for nailing by this method. At present the latter group are rarely so treated as fixation was ordinarily found to be unsatisfactory. There were 14 males and 42 females. The ages were from 14 to 89; average 65.2 years. The injury resulted from a fall in 55 cases, of which 38 or 67.7 per cent occurred within the home. Preoperative complications found on admission were frequent: 32 patients presented cardiovascular-renal disease,

Fig. 5. May 18, 1938. Union in excellent position is present. (Case 2.)

of whom one suffered with severe diabetes mellitus and 7 suffered with senile dementia. Five were incontinent, two had hemiplegia, one was blind, three were admitted with decubitus ulcers, two had ununited fractures of the neck of the opposite femur, of whom one had advanced multiple arthritis and emphysema in addition. Two had additional fractures involving the upper extremities and one was suffering with advanced pulmonary tuberculosis.

The time of operation is adapted to the individual case. It is no longer felt that immediate operation is indicated, and present practice is to apply traction to the injured extremity, to combat shock if present, and to study the medical aspects of the individual case before proceeding with surgery. The time interval following fracture varied from a few hours to 29 days and now averages two to three days following admission.

Fig. 6. Intracapsular fracture of femoral neck. May 4, 1937. (Case 3, woman of 45.)

The anesthetic is likewise varied with the patient's needs. Local anesthesia was used in 17 cases, general in 13, twilight combined with local or general anesthesia in 22, twilight alone in 3 and spinal in 1. Basal anesthesia consisting of nembutal, morphine and scopolamine is now routinely used; and general anesthesia is usually preferred at least through the reduction stage, as it definitely facilitates reduction of the fracture without apparently increasing the mortality or morbidity.

The steps of the operation consist of reduction of the fracture by the Whitman or Leadbetter method or some modification thereof. The reduction is verified by anteroposterior and vertical portable x-ray, and is repeated until satisfactory reduction is shown in both views. Reduction is usually followed by Cotton's impaction with padded block and mallet. Through a lateral incision the lateral

Fig. 7. Union in excellent position is present. Note proximal nail extruding from bone. Mar. 7, 1938. (Case 3.)

surface of the subtrochanteric region of the femur is then exposed, the nails partially inserted through drill holes through the cortex and the position checked by two plane x-ray. If the position is satisfactory additional holes are drilled through the trochanter and neck into the femoral head (to favor vascularization of the head), the nails are driven home, and the wound closed. Final position two plane x-rays are then made. In two cases in this series satisfactory closed reduction could not be obtained, and open reduction was performed prior to insertion of the nails. The operation has been simplified by using a leg holder previously described.[18]

Postoperative care has varied from immediate use of the wheel chair to rest in bed for six months (the latter case being at the patient's insistence). No external fixation other than Buck's traction, pillow or sandbag support, or boot cast with rotation bar, has

been employed. The back rest, trapeze, deep breathing exercises and frequent position changes are immediately instituted. Present practice is rest in bed for six weeks preferably with boot cast and rotation bar, at the end of which time the use of crutches without weight bearing is begun if x-ray shows satisfactory progress. The crutches are discarded only after trabeculae are shown by x-ray to

Fig. 8. Jan. 18, 1935. Ununited intracapsular fracture neck left femur. A flanged nail had been inserted elsewhere two years previously. (Case 4, woman of 87.)

cross the line of fracture, which is usually about six months from time of operation.

Postoperative hospital days varied from 7 to 90, and averaged 21 in cases whose homes afforted suitable care.

Postoperative general complications consisted of the following: 3 patients walked without consent or support within six days following operation; in one case pulmonary embolism involved both lower lobes; 4 patients developed senile dementia and one developed diabetic-arteriosclerotic gangrene of both lower extremities.

Local complications consisted of:

hematoma in wound—1,
femoral neck absorption with penetration of nail into joint—6,
nail broken—2,
nail bent—1,
nail placed outside neck or head through error—2 (early cases—without proper x-ray control),
sterile abscess in wound four months postoperative—1,
operative infections—1 (low-grade, soft tissue only),
operative bone infections—0.

There were no operative deaths, and no death occurring during convalescence could be attributed to the operation. From the preoperative complications listed, and the age of this group it is apparent that the life expectancy of many of these persons was not great, even without the shock incident to a major fracture. There were 14 deaths within one year and 4 deaths between one and two years

Fig. 9. Feb. 12, 1937. Ununited fracture neck left femur with nail removed, and fresh intracapsular fracture neck right femur. (Case 4, woman of 89.)

following operation, the majority resulting from cerebral hemorrhage, uremia or cardiac disease with congestive failure. Although definite proof cannot be easily presented it is felt that life was prolonged, and complications both general and local were decreased, by operative treatment of the fracture.

Bony union can be determined only by careful and prolonged clinical and roentgen study. It has long been recognized that in the intertrochanteric fractures non-union is practically unknown, and that in the intracapsular type apparent bony union may occur early in convalescence, only to break down with the development of a typical non-union several months later. For these reasons a two-year follow up with x-ray evidence of bony union as shown by trabeculae indisputably crossing the line of fracture, was adopted as the standard in deciding union in this series. On this basis 12 patients are available who received intracapsular fracture for final two year report. Of this number 10 or 83.3 per cent show bony union and 2 or 16.7 per cent show non-union. Of the ten cases showing union, the head is definitely necrotic and undergoing pressure changes in one. Bony union occurred in all cases of inter-

trochanteric fracture, usually with the proximal fragment in moderate varus position.

Removal of fixation—Experience to date has been limited to the use of Moore nails, which are made of stainless chrome-nickel steel known as 18-8 steel. They have been removed in 9 cases. This

Fig. 10. Sept. 12, 1938. Solid bony union neck right femur. (Case 4.)

removal was occasioned by penetration of the nail into the joint in 3 cases; by loosening of one or more nails in 3 cases, and because of recurring pain in the hip area in 3 cases. All showed localized areas of granulation tissue about the nail head which was felt to be the result of local pressure necrosis. Cultures made at time of removal were in all instances sterile. Present opinion is that removal of the fixation device after it has served its purpose is advisable.

It should be here emphasized that treatment of hip fractures by internal fixation is not a simple procedure, despite the statement of various authors to the contrary. There are many pitfalls to be avoided if the fragments are to be accurately reduced, the fixation device properly applied, weight-bearing instituted at the proper time, and the patient's general condition maintained at satisfactory level over a long period of time. The operation is a difficult procedure technically, and should be performed only by one experienced in fracture principles, and in an operating room where accurate x-ray control is available. To do other than this is to invite serious complications and to bring discredit upon the method. The operation per se is only one step in the long and often laborious process of restoring function to a severely damaged joint in an individual

Fig. 11. Apr. 10, 1934. Intracapsular fracture neck right femur. (Case 5, woman of 63.)

whose resistance is often low, and whose life expectancy is frequently short. By nailing fractures of the femoral neck we only substitute an internal splint for an external splint, thereby facilitating the convalescent care of the patient and affording more secure fixation of the fragments. If one expects more than this at present, disappointment will be his lot.

Illustrative Cases

Case 1. J. H., a negro, 67 years of age, with large right inguinal hernia and cardiovascular-renal disease with congestive failure, was brought in Dec. 29, 1935, because of a comminuted, intertrochanteric fracture of the right femur sustained in a fall in his home the same date. Buck's traction was applied and digitalization begun. On Jan. 1, 1936 Moore nails were inserted under 1 per cent novocain anesthesia. No postoperative fixation was applied. A wheel chair was used on the fourteenth postoperative day; crutches were allowed at the end of ten weeks, and discarded May 27, 1936 (five months postoperative). A good clinical result was obtained, the patient walking without support or limp. On Sept. 24, 1937 the posterodistal nail was found to be unscrewing within the head and the nail end was palpable subcutaneously.

The nails were removed under local anesthesia Oct. 7, 1937 without difficulty. Culture of the nails was sterile. He died Feb. 27, 1938 of arteriosclerotic heart disease with congestive failure.

CASE 2. Mrs. W. A. N., 64 years of age, fell in her home on March 9, 1936, receiving a subcapital fracture of the left femur. The following day under local anesthesia the fracture was reduced and nailed by the Moore

Fig. 12. Feb. 12, 1938. Ununited fracture neck right femur (treated by cast) and fresh intracapsular fracture neck left femur. (Case 5, woman of 67.)

method. She remained in bed for four weeks, and then was allowed up in a wheel chair for two weeks. Crutches were allowed six weeks following operation and discarded eight months after reduction. She is free of all hip complaint and walks without support or limp.

CASE 3. Mrs. L.D.L., 45 years of age, received a subcapital fracture of the neck of the left femur May 4, 1937 when she fell in her home. Buck's traction was applied the same day. On May 7, Moore nails were inserted using 1 per cent novocain anesthesia. She was kept in bed with the extremities widely abducted for six weeks; crutches were then used and discarded Aug. 26, 1937. X-ray Aug. 6, 1937 showed trabeculae crossing the fracture line with external callus. On March 7, 1938 a nail was palpable and on x-ray the proximal nail was found to be extruded practically its entire length. On the following day all nails were removed, the distal two nails being removed with great difficulty. Culture of the nails showed no growth. She is free of all complaint and walks without support or limp, the two sides being indistinguishable clinically.

CASE 4. Miss M. L., aged 87 years, was first seen in January 1935 complaining of pain in the left hip. She had received a subcapital fracture of the left femoral neck two years previously for which a Smith-Petersen nail had been inserted in another city. At the time of initial examination non-union was present. The nail was found to be loose: it was easily removed. Further operations were refused by the patient.

On Feb. 12, 1937 she again fell in her home receiving a subcapital fracture of the right femoral neck. She was then 89 years of age, suffering with advanced cardiovascular-renal disease and senile dementia. Three days later under ether anesthesia Moore nails were inserted. A wheel chair was permitted after the third postoperative day; crutches were used after six weeks. Solid bony union was obtained. There was a normal range of painless active

Fig. 13. June 4, 1938. Ununited fracture of femoral neck (bilateral). Note degenerative changes of head left femur which appears to be necrotic, probably the result of circulatory damage received at time of accident. (Case 5.)

motion in the right hip. Crutches were retained because of disability of the left hip. She died of uremia Nov. 30, 1938.

CASE 5. Mrs. J. H. B., 63 years of age, with advanced atrophic arthritis, cardiovascular-renal disease and bronchiecstasis, suffered subcapital fracture of the neck of right femur April 10, 1934 when she fell in her home. Buck's traction was applied. On the following day the fracture was reduced under ether anesthesia, impacted by Cotton's method and a double spica cast applied. Cast fixation was continued for four and one-half months, followed by non-union with extreme absorption of the neck and apparent aseptic necrosis of the head.

On Feb. 10, 1938 she again fell in her home, receiving a subcapital fracture of the left femoral neck. February 12 under ether anesthesia over-correction of the fragments was obtained, the fragments impacted by Cotton's method and Moore nails inserted. A wheel chair was used after the fourth postoperative day. On June 4, 1938 non-union was present with upward displacement of the distal fragment, marked absorption of the neck, penetration of the nails into the joint, partial extrusion of the nails and apparent necrosis of the femoral head. Pain was most marked in the right hip. Reconstruction of the hip was not advised because of the poor general condition. She remained in a wheel chair until her fatal illness: she died of pneumonia Nov. 8, 1938.

Conclusions

Based on four years' experience with 56 cases of intracapsular and extracapsular fractures of the femur the following conclusions are felt to be warranted:

1. Internal fixation is the method of choice in the treatment of intracapsular fractures of the femur because of decreased mortality, increased percentage of good functional hips with proven bony union, decreased period of disability, increased comfort to the patient, and decreased period of hospitalization.

2. Difficulty has been experienced in maintaining the fragments in good position in extracapsular fractures treated by the Moore method of nailing, and it is now used only in selected cases of this type. It is thought that the principle of internal fixation is sound and desirable in this type of fracture and that a satisfactory method of its application will be devised.

3. Internal fixation must be regarded merely as an improved method of applying an old principle, namely that of fixation, whereby the bone fragments are held in position more securely. This increased fixation of the fragments is an aid in securing bony union of the fracture, and greatly facilitates the convalescent care of the patient.

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THE TREATMENT OF CANCER OF THE BREAST

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THE treatment of cancer of the breast, judged, as all treatment should be, by the results obtained, is still an unsolved problem. In the forty-five years that have passed since Doctor Halsted reported the first five-year results following the use of his improved method of radical amputation of the breast, surgeons have sometimes equaled but have hardly surpassed the percentage of "cures" then recorded. Surgery has added little to the perfection of the Halsted technic, and x-ray therapy until recent years has been of very doubtful value either alone or as an adjunct to surgical treatment. It has been apparent that an intensive and sustained program of public education offered, by making possible early diagnosis and earlier treatment, the only hope for progress against the inroads of this disease. The development in the past few years of bigger and better x-ray machines with recent radical improvements in the technic of roentgen therapy as applied to cancer of the breast bids fair to modify accepted methods of treatment and to improve materially the percentage of "cures." It is the purpose of this paper to review briefly these methods of treatment and to outline the indications for the use of each with special reference to the combination of surgery and x-ray.

The history of the treatment of breast cancer is interesting to note in passing. We think of the treatment of this condition as essentially modern, but it is recorded that Galen in the third century described a method of operating on cancer of the breast in which he made a clean sweep of that structure. He made also the important observation that "early operation is advisable, as the disease is curable at the beginning." In operations after Galen the breast was removed by the cautery, torn from the chest wall by blunt dissection with the surgeon's hands, or sheared off with large clippers. Destruction of the tumor by means of caustics was a common practice that has persisted to this day.

Thomas Bartholimus in the seventeenth century recognized and described cancer of the breast. Jean Louis Petit in the eighteenth century called attention first to the importance of the enlarged lymphatic glands. Poirer in 1833 described accurately the lymphatics of the breast, laying the foundation for a clearer understanding of the spread of cancer. Lister in the early sixties suggested removal of the axillary fat and glands. Moore in 1867 recommended the

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routine removal of the entire breast. Excision of the pectoral fascia routinely was first practiced by Volkmann in 1882. Kuster in 1883 first advised removal of the axillary contents as a routine proceeding. The removal of the pectoralis major as a regular step in the radical amputation of the breast was first practiced by Halsted in 1888. In 1894 Halsted published the results of the routine use of his improved operative technic in the treatment of breast cancer—a technic with which we are all familiar and which with a few slight modifications is the operation used today by surgeons the world over.

In the original Halsted series 70 per cent of the cases in which the disease was confined to the breast—stage 1—were well at the end of five years, and about 20 per cent of the cases having axillary metastases—stage 2—survived the same period without recurrence. In a proper appraisal of these results—which seem rather commonplace to us at present—one must remember that the teachers of surgery of that day could tell of no cures for cancer of the breast, that in Kuster's time (1883) several operative series of cases showed 83 to 100 per cent involvement of the axilla, and that in the hands of such masters as Billroth, Velpeau, and Bergemann local recurrences averaged from 60 to 90 per cent. The per cent of local recurrence in the Halsted series was 6. The operative mortality in the first series of Billroth's cases was 23 per cent (Keen). I do not recall having seen a patient die as a direct result of the radical removal of the breast for cancer.

In 1895 x-rays were discovered by Roentgen, and in 1898 the Curies gave radium to the world. In the past twenty years both these agents have been extensively used in the treatment of cancer of the breast by irradiation, either alone, or as an adjunct to surgical treatment. Greatly improved technic has recently brought this form of cancer therapy to the front so that today it stands, to quote a noted authority, as our "hope for the future."

It is well to preface any discussion of the treatment of mammary malignancy by mention of the interesting researches of Daland, who has shown that of 100 untreated cases of this disease, 26 were living after five years. Contrast that series with 100 similar cases treated carefully in any of our good clinics with a five-year survival rate of only 32 to 39 per cent. Remember, however, that of 100 early cases, receiving adequate surgical treatment, 70 will not only be alive at the end of five years, but will have no signs or symptoms of the disease.

The best treatment for carcinoma of the breast is prompt and adequate removal by surgery of the breast and its environs. Radical amputation along the lines laid down by Halsted is indicated in any case presenting a reasonable possibility that the tumor growth has

not spread beyond the areas to be removed by the operation. It is contraindicated in cases showing advanced axillary involvement, in rapidly growing tumors with extensive involvement of the skin, in individuals under 30, and in lactating breasts. Hertzler says, "I have regretted every operation I have done in cancer of the mammary gland in the young."

It is not necessary here to describe in detail the well-known steps of the radical amputation of the breast. Those of us who are surgeons know them, and those who are not, are not interested. Suffice it to say that the operation must be extensive and complete. There is no rational surgical treatment for malignancy of the breast that does not include dissection of the axilla, with the exception of obviously inoperable ulcerating cancers of slow growth. In these cases local excision of the ulcerating mass rids the patient of a constant and revolting reminder of her disease, gives her much comfort on her way out, and is infinitely worth while.

Next to surgery the x-ray has been our main reliance in the treatment of cancer of the breast. It is used alone without other treatment, usually in inoperable cases, or following surgical removal of the breast, or preceding such removal. Irradiation "cures," according to Adair, "are produced by locking up the disease in dense fibrous tissue and starving the disease process by endarteritis, and by the direct insult to the cancer cell which is produced by the rays." In a large group of patients with primary operable carcinoma of the breast, treated over a period of seven years at the Memorial Hospital for Cancer and Allied Diseases, New York, by irradiation methods alone, the following results were noted: In selected cases, disease confined to the breast, 45 per cent were well after five years. In 53 cases, with involvement of both breast and axilla, not a single five-year cure was obtained. Of the whole group 10 to 12 per cent were apparently free of disease after five years. Adair and Hoffman concluded from this that "There is no basis for the assumption that irradiation is a satisfactory substitute for careful meticulous cancer surgery." Stewart does not advocate irradiation alone as he has observed numerous bad results. Maisin, after treating a considerable number of operable cases with x-ray alone, finds that the results of such treatment are at least as good as those following surgery alone.

To those unfortunate individuals, who have drawn the black beans and to whom treatment by the knife is denied, the roentgenologist offers much comfort. The feeling that all is not lost, the hope that maybe the miracle of cure will happen here, the satisfaction that something is being done to fight the disease even though it be a losing battle, is of greater therapeutic value than the actual imprisonment and dissolution of cancer cells.

Extirpation of the ovaries as a means of inhibiting the growth of ineradicable carcinoma of the breast, proposed by Beatson in 1896, and popular for a short time thereafter, has in recent years enjoyed a revival of interest as a part of postoperative roentgen therapy. Evaluation of ovarian sterilization for breast carcinoma is the subject of a careful study by Taylor of Boston. His conclusions are worth quoting here:

> As a therapeutic procedure, artificial menopause is of definite palliative benefit to about one-third of patients with inoperable or recurrent carcinoma of the breast. The most striking and in most instances the most durable results are evident in the group suffering from osseous metastases; . . . there is nothing in our study to warrant the conclusion that artificial menopause is likely to be of striking benefit as a prophylactic procedure against recurrence after radical mastectomy.

The use of x-ray in the treatment of postoperative recurrence is of great comfort to the surgeon. The kindly roentgenologist is near to take from our defeated hands the doomed patient, rekindle a ray of hope in her bosom, and help her to carry on. That his labors are not in vain is apparent from the optimistic observations of Pfahler and Vastine. Of 491 patients treated by them for recurrence of breast cancer after operation, 39.7 per cent were well five years after treatment for local recurrence, 23.3 per cent were well five years after treatment for axillary or supraclavicular recurrence, and 5 per cent were well five years after treatment for distant metastases. In the entire series 18.5 per cent were in good health five years after x-ray treatment.

Something over five years ago was introduced in this country the Coutard technic of roentgen therapy by means of which it was possible to deliver a maximum amount of x-ray (10,000 to 11,000 r) in fractional doses over a period of weeks with minimum damage to the normal tissues. The method was promptly applied to the treatment of breast cancer, both before and after operation. The last paper written by Bloodgood was a preliminary report giving the early experience of his clinic with preoperative x-ray treatment. His work has been ably carried on by George A. Stewart, who recently presented before the Southern Medical Association his conclusions after five years of observation in the use of this technic. Over a four to five-week period a dose of 10,000 to 11,000 r units through four portals or more is given the patient. After two or three months, in which all skin reaction comes and goes and the maximum benefit of the irradiation is allowed to take place, the complete operation is performed. Possible complications are nausea, discomfort, fever, dermatitis, and pneumonitis. Stewart concludes that preoperative irradiation "will do more to increase our ultimate cures than any method alone." In early cases without axil-

lary involvement the question of surgery alone versus preoperative x-ray treatment, he concedes, admits of some argument; but he feels that the latter is worth while and productive of no harm. Cohn, also a former associate of Bloodgood, says that in early cases without axillary metastasis preoperative irradiation is of no value, but he observes that in those with axillary metastasis 44 per cent having irradiation followed by radical surgery were well after five years, whereas 24 per cent of such cases treated by operation alone survived the five-year period. In Pfahler's series the percentage of five-year "cures" following operation alone was practically doubled (from 23 to 46 per cent) by the addition of preoperative x-ray in the stage 2 cases. He recommends x-ray treatment for two weeks and operation the third week.

Lund, of the Harvard Cancer Commission, does not use preoperative x-ray therapy "because definite proof of its value is not clear." White believes that "not enough evidence has been brought forward to warrant insistence that the patient submit to preoperative therapy." Adair in recent addresses insists that we are due to be disappointed in preoperative x-ray treatment. He agrees with Stewart that in stage 1 cases—disease confined to the breast—it does not enhance the effectiveness of a well-planned operation; and his experience with over 2500 cases forces him to the conclusion that in the stage 2 cases, axillary metastasis but operable, it is not worth the trouble. This conflict of authoritative opinions is rather bewildering and emphasizes the fact that x-ray procedures are as yet not sufficiently standardized to be very accurate.

Interstitial radiation of cancer of the breast has been studied in 26 operable cases by McKitrick. The total dosage given was 18,000 to 25,000 mg. hours of radium. Common after-effects are pain and limitation of abduction of the arm. It has no advantage over surgery, according to White, except under special conditions such as heart disease, or debilitating constitutional disease.

The implantation of radium in the wound at the time of operation has been advocated by Moore and Petersen, who report 46 per cent of five-year cures following the use of this method in cases having axillary metastases. I have had no experience with this method, but the figures speak for themselves.

So much for the various methods of treatment. What now of the outlook for recovery? The prognosis in cancer of the breast is influenced by (1) the type of cancer, (2) the rate of growth and grade of malignancy (Broders), (3) the relation of the cancer to the general condition of the patient, and (4) the nature of the treatment.

According to Lewis and Geschickter, the comedo adenocarcinoma offers the most favorable prognosis of all the types of breast cancer.

Hertzler says the colloid type has the best outlook. Of more importance is the rate of growth, which varies with the grade of malignancy in which the tumor falls (Broders). To quote Hertzler again, "the longer the duration of the tumor and the older the patient, the more certain the growth will continue its deliberate habits." In the Cook Hospital series all the patients with grade 4 cancer are dead or have a recurrence of the disease. Of nineteen grade 3 patients, five are dead, and one has a recurrence. Of eight grade 2 cases one has a recurrence, and one is unaccounted for, while six are quite well. All of which means that women with cancer must not be too unlucky. Those who draw the grade 4—27.5 per cent in my series—have almost no chance from the beginning. One can also reason from this why it is that prompt surgery in early cases is followed by only 70 per cent five-year cures.

The patient's general condition is an important factor in predicting the course of the disease. In general, the younger the patient, the worse the prognosis. In my series of six individuals under 40, three lived less than two years, and one has a recurrence. One of these, a lactating mother—the only one receiving preoperative x-ray—did not live a year. "Cures" in lactation cancer are very rare. Of the effect of the constitutional peculiarities on prognosis it has been said that "fair, fat, and forty spells doom," whereas "thin, weary, and cantankerous, as well as forty, has a better chance." (Hertzler).

The last and (from the surgeon's viewpoint, at least) most decisive factor influencing prognosis is the nature of the treatment. Prompt and adequate removal of the breast and its environs offers the best chance for recovery. The patient must present herself early—in stage 1 while the growth is confined to the breast—and the doctor must recognize the disease. To this end our educational efforts must be directed without ceasing. The treatment in stage 1 is radical amputation, and the outlook for five-year freedom from disease is about 70 per cent. I agree with White, Cohn, and others that preoperative and postoperative x-ray add little or nothing here. We will lose the grade 4 cases under any form of treatment.

To the women who show on examination evidence of axillary metastasis—stage 2, but operable—thorough preoperative treatment should be given, followed in 6 to 8 weeks by radical amputation of the breast. Their chances of being "well" at the end of five years will approximate 45 per cent—almost double, if we may believe Stewart, Cohn, and Pfahler, the percentage offered by operation alone without benefit of preoperative roentgen therapy. Certain definite drawbacks to this treatment are readily apparent and must be noted here. The patient may get impatient and restive over preoperative delay; the pathologist, unless biopsy is obtained before

treatment is begun, moans over his almost futile search for cancer in the amputated breast; and the surgeon mutters in his mask over the increased technical difficulties of the operation and laments that his wounds heal not per primam.

To those more unfortunate patients who come in the inoperable group and to whom the hope of cure is apparently denied, thorough x-ray treatment with local removal of ulcerating lesions may be of great comfort. These old ladies, usually past 60, may survive for years and are our most grateful patients.

In conclusion, it is well to reflect on the revelations of the records of the Johns Hopkins Hospital as reviewed by Lewis and Reinhoff, to the effect that there is no evidence that cancer of the breast is ever completely eradicated, and to remember that "the ultimate goal, a matter too often overlooked, is not alone to prolong life indefinitely, but to provide escape from it pleasantly."

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DIVERTICULA OF THE JEJUNUM

When intestinal diverticulosis or diverticulitis is mentioned one naturally thinks of the colon, and it is true that the colon is more frequently the seat of diverticula than any other part of the intestinal canal. Next comes the duodenum, and next the ileum and jejunum. Diverticula of the ileum are generally of the Meckel, or congenital variety; acquired diverticula are commoner in the jejunum than in the ileum. Apparently the lesion in the jejunum is so rare that few surgical textbooks even mention it. Edwards[1] stated that until 1936 only 78 cases of jejunal diverticula had been reported in the literature. He had observed 16 cases, 4 of which were confirmed by operation, and 8 confirmed by autopsy. The other four cases were diagnosed by x-ray only. As usually happens when a lesion is reported as uncommon, doubtless diverticula of the jejunum are more frequent than is supposed. The x-ray, which is indispensable in diagnosis, does not always demonstrate such diverticula unless they are large and happen to retain barium after the jejunum is emptied. Again, even postmortem examination is not a reliable means of recognizing the lesion unless the jejunum is explored with great care, inasmuch as the diverticula are almost always found on the mesenteric border, covered with fat, and therefore not nearly as conspicuous as if they occupied the opposite border.

Of Edwards' 16 patients 9 were men and 7 were women, the average age being 55. Most diverticula are found in the upper jejunum, and as stated above appear on the mesenteric border corresponding with the passage of the blood vessels. Pathologic study

of cases in different stages of development show that each diverticulum begins in two parts apparently straddling the blood vessels. One of the parts grows larger than the other, and gradually takes in the smaller one, finally making one diverticulum. While the etiology of all diverticula is difficult to explain, it is believed that arteriosclerosis may play a part in the cause of the lesion in the jejunum. The hardening of the arteries at the entrance into the wall of the gut weakens the wall at this point and allows stretching and the formation of diverticula. Other etiologic factors have been described, but the part they play is very uncertain.

Occasionally jejunal diverticula are discovered postmortem in patients who have presented no symptoms, but most patients complain of abdominal pain, more or less severe, accompanied by troublesome and noisy flatulence, especially just after meals. At times there is vomiting and intestinal obstruction may be suspected, or acute obstruction may supervene.

The only curative treatment is surgical operation, with excision of the diverticula-bearing segment of the intestine. Such radical treatment should be postponed as long as possible, although medical management is of little avail. The diet should be easily digestible, and the bowels kept open with mild laxatives. An important reason for delaying operation is that there is no way of telling when the formation of diverticula will cease; more such pockets may form after the original ones have been removed. If operation is done it must be a radical procedure. Shortcircuiting maneuvers are useless.

In studying the cause of abdominal symptoms not readily explained by the diagnosis of common conditions, such a lesion as this should be borne in mind. How often is the abdomen opened for surgical treatment of a diseased appendix or gallbladder or other organ, and no definite pathologic lesion discovered? In such cases jejunal diverticula, though probably rare, offers another entity to be considered.

FRANK K. BOLAND, M. D.

1. Edwards, Harold C.: Diverticula and Diverticulitis of the Intestine, Baltimore: The Williams and Wilkins Co., 1939.

BOOK REVIEWS

The Editors of THE SOUTHERN SURGEON *will at all times welcome new books in the field of surgery and will acknowledge their receipt in these pages. The Editors do not, however, agree to review all books that have been submitted without solicitation.*

CLINICAL UROLOGY. By OSWALD SWINNEY LOWSLEY, A.B., M.D., F.A.C.S., Director of the Department of Urology (James Buchanan Brady Foundation) of the New York Hospital; and THOMAS JOSEPH KIRWIN, M.A., M.S., M.D., F.A.C.S., Attending Surgeon of the Department of Urology (James Buchanan Brady Foundation) of the New York Hospital. Illustrated by WILLIAM P. DIDUSCH. In Two Volumes. 1684 pages, with 365 illustrations. Price, $10. Baltimore: The Williams & Wilkins Company, 1940.

The professional reviewer does not often have to put a brake on his enthusiasm, but this one feels that the new work by Lowsley and Kirwin requires all his superlatives. In the first place it is published in two volumes, which makes each of convenient size to handle. In the second, it is eminently a practical work, it can be read with understanding and pleasure by a junior medical student and yet the most experienced urologist will be apt to find it convenient for occasional reference—and certainly the man in general practice will find it invaluable. Each part of the urogenital tract is taken up in succession, with a discussion of its embryology, anatomy, histology and pathology. This is followed by a comprehensive discussion of the diagnosis and treatment of the anomalies and diseases of the part. In reading each section, the reviewer thought that it was so fine that it should be particularly commended, but on completing the work he concluded that to single out any one would be invidious.

The first volume begins with an outline of taking a history on a urologic patient, and it is emphasized, as has been done more than once in these pages, that the first appearance of hematuria, for example, requires a painstaking search for its source. Chapters follow on the examination of the urine, tests of renal function, instrumental examination, roentgenography of the genitourinary tract, and anesthesia before taking up the special organs. It should be mentioned that the authors include women and children under the heading of urologic patients. There are numerous references to the psychiatric angles of urology, and discussions of the general management of patients, including dietary treatment, and sections on the use of radium and deep x-ray therapy. The book, however, is primarily concerned with surgery. Not only are the various operative procedures clearly described but they are fully illustrated. Mr. Didusch may not be the greatest medical artist in the world, but there is certainly none better when it comes to depicting operations on the genitourinary tract and the drawings in this book were not rushed through to make a deadline, —some of them date back fifteen years.

In short Drs. Lowsley and Kirwin present here urology as practiced by the best clinicians in 1940.

BATTLE SHIELD OF THE REPUBLIC. By MAJOR MALCOLM WHEELER-NICHOLSON. 212 pages. Price, $1.50. New York: The Macmillan Company, 1940.

The Macmillan Company, in our opinion, should be very highly commended for the publication in recent months of timely monographs about the present World War. They should be widely read. Early in the summer a collection of essays, "Defense for America," edited by William Allen White, was eagerly read by this reviewer. Its theme was "All aid to Britain short of

War." Before a notice of it could be published in these pages, this policy had ceased to be controversial. The thesis of the present work will hardly be so readily accepted.

Major Wheeler-Nicholson is very much worried about the present state of the American Army. He points out that, although our Army has never yet gone down in defeat, it has never faced alone the army of a first class power. He argues that the only reason for having an army is to win battles, and that the present system of promotion by seniority is not the best way to produce officers who can win battles. While one hopes that there is less cerebral ossification among the generals than is suggested in this book, it is stimulating and provocative. Its charges should be carefully studied and its arguments thoughtfully weighed: if they are sustained something has got to be done and done quick.

CLINICAL DIABETES MELLITUS AND HYPERINSULINISM. By RUSSELL M. WILDER, M.D., Ph.D., F.A.C.P., Professor and Chief of the Department of Medicine, The Mayo Foundation for Medical Education and Research, University of Minnesota; Head of the Section on Metabolism Therapy, Division of Medicine, The Mayo Clinic, Rochester, Minnesota. 459 pages, with 19 illustrations. Price, $6. Philadelphia and London: W. B. Saunders Company, 1940.

The surgeon who was graduated twenty years ago learned in his student days that the presence of sugar in the urine usually indicated diabetes, that such patients should partake sparingly of carbohydrates and hope for the best. It was especially emphasized that a diabetic patient should not be subjected to any operation that could possibly be avoided, for experience had taught that he had a very poor chance of surviving a surgical procedure of any magnitude. Today, with proper management, the diabetic can face any operation with equanimity.

The surgeon who is not closely allied with a competent internist should have at hand a copy of Wilder's new book. The author has for many years been an important member of a group whose fame is largely surgical. This close association with busy surgeons is reflected in the usefulness of his book.

The closing section of the monograph deals with hyperinsulinism—a clinical entity put on the map by our friend in Birmingham, a disease which, though rare, can be cured by surgery.

THE LOUSE. *An Account of the Lice which Infest Man, Their Medical Importance and Control.* By PATRICK A. BUXTON, M.A., M.R.C.S., L.R.C.P., D.T.M. & H., Director, Department of Medical Entomology, London School of Hygiene and Tropical Medicine; Professor of Medical Entomology, University of London. 115 pages, with 28 illustrations. Price, $3. Baltimore: The Williams & Wilkins Company, 1940.

When we were very young the louse was considered unspeakable. Even Robert Burns' poem about the louse on the lady's bonnet was considered improper and was omitted from the school anthologies. During the first World War the body louse entered polite society under the pseudonym of "cootie." Since then "lousy" has become the debutante's pet term of disapprobation and here we are reviewing a whole book devoted to the louse!

Granting that we rarely encounter a louse in our private practice, in time of war the louse becomes important in the case of troops and of refugees. We

fear it will therefore become of general value before many months, for this authoritative little book tells the doctor what he needs to know about lice.

THE HEAD AND NECK IN ROENTGEN DIAGNOSIS. By HENRY K. PANCOAST, M. D., Late Professor of Radiology and Director of the Department of Radiology, University of Pennsylvania, and EUGENE P. PENDERGRASS, M. D., Professor of Radiology, University of Pennsylvania, Director of the Department of Radiology, University of Pennsylvania, and J. PARSONS SCHAEFFER, M. D., Ph.D., Professor of Anatomy and Director of the Daniel Baugh Institute of Anatomy, Jefferson Medical College. 976 pages, with 1251 illustrations. Price, $12.50. Springfield: Charles C Thomas, Publisher, 1940.

After reading this volume, one gains the impression that no fact has been omitted which is in any way related to diseases of the head and neck. It is a vast encyclopedia; a reference work packed with essential information on many subjects.

The successful roentgenologist nowadays must be all things to all specialists. Likewise the specialists have come to lean heavily on the competent roentgenologists for support in interpretations of symptoms. This most complete book serves as a reference work for all of them.

The essential anatomy of the head and neck is thoroughly reviewed at the beginning as well as the commonly misunderstood anomalies. An unusual feature is the description of every type of x-ray picture which can be produced by aberrant blood vessels.

For the benefit of the orthopedic and plastic surgeons in conference with the roentgenologist, all conceivable injuries or fractures of the face and neck are illustrated and described. Moreover, the various diseases of the bones in this region are carefully studied.

For the neurosurgeons and pathologists a great part of this book is devoted to head injuries, brain tumors and their localization, pneumoencephalography and tumors of the scalp.

The dentists and all who are interested in focal dental infections will gain much knowledge from the chapters on pathologic changes in the jaws and teeth.

Otorhinolaryngologists will find here answers to many questions about x-ray interpretation of lesions of the nose or sinuses, foreign body localization in the eye, and complications of surgery in the nose or throat.

Bronchoscopists will find excellent illustrations describing methods of identifying and locating foreign bodies in the air and food passages.

In short this book states practically all the important facts about the head and neck. It isn't a volume that one would read from cover to cover simply because it is an encyclopedia. However, it offers a great source of information on any aspect of diseases of the head and neck. The articles are clear and brief. The illustrations are most adequate and there are more than 1200 of them. There is a welcome lack of padding which congests most such reference works. All in all, this is the most accessible collection of data on lesions of the head and neck which can be examined by x-rays.

—WALTER G. STUCK, M. D.

MANAGEMENT OF THE CARDIAC PATIENT. By WILLIAM G. LEAMAN, JR., M.D., F.A.C.P., Assistant Professor of Medicine in Charge of the Department of Cardiology, Woman's Medical College of Pennsylvania, Philadelphia; Cardiologist, Woman's College, Memorial, Northeastern Hospitals and Philadelphia Hospital for Contagious Diseases; Consulting Cardiologist, St. Luke's, Children's Hospitals, Philadelphia, etc. 705 pages, with 255 original illustrations, two of which are in color. Price, $6.50. Philadelphia, London and Montreal: J. B. Lippincott Company, 1940.

As Dr. Stroud says in the Foreword, "The rapid strides in electrocardiography, roentgenology and blood chemistry in the diagnosis and treatment of heart disease" have made it "almost impossible" for the general practitioner "to follow the speakers at the various medical meetings." Dr. Leaman has tackled this problem by applying the "case system" introduced many years ago in legal education. After the introductory chapters, he outlines the diagnosis and treatment of many cases of heart disease with a competent discussion of each. Chapters are also devoted to "Allergy and the Heart," "Cardiac Problems in Surgical Practice," "The Prescription of Exercise," and "An Introduction to Electrocardiography." There is an excellent bibliography for the man who wants to delve deeper. The book is so modern that it discusses the advisability of a cardiac patient's flying across the continent.

Though one might quibble over minutiae occasionally, the book is thoroughly sound, eminently practical. The reviewer agrees with Dr. Stroud in that, for the purposes for which it was prepared, "no more valuable book has appeared."

TABER'S CYCLOPEDIC MEDICAL DICTIONARY INCLUDING A DIGEST OF MEDICAL SUBJECTS. By CLARENCE WILBUR TABER, Author, Taber's Dictionary for Nurses, The Cumulative Atlas of the Human Body, Taber's Dietetic Charts, Dictionary of Food and Nutrition, etc., and ASSOCIATES. 273 illustrations. Philadelphia: F. A. Davis Company, 1940.

It's extraordinary how much information is compactly presented in this small volume, extraordinary how often the reviewer has referred to it during the two weeks it has been on his desk. It even gives an outline of the various diseases including treatment. After many attempts to be disappointed, he finally found that sulfathiazole was recommended only for pneumonia.

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